

NOVAES, (F. P.)

THE  
ORIGIN, NATURE, SYMPTOMS  
AND  
TREATMENT,  
OF  
YELLOW FEVER,



BY  
DR. F. PAULA NOVAES,

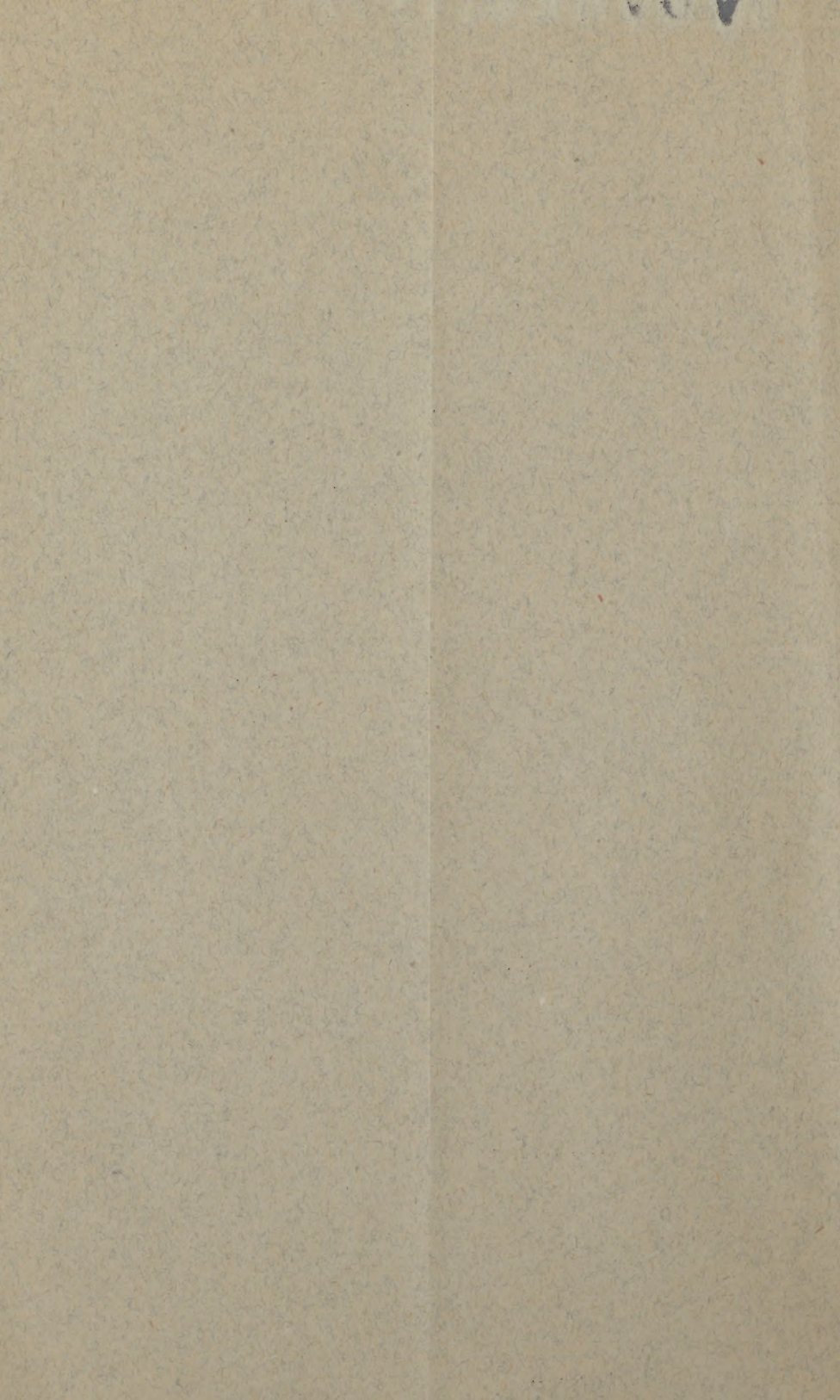
(ST. PAUL—BRAZIL.)

RESIDENT PHYSICIAN AT THE PHILADELPHIA HOSPITAL.

*\*American*

---

Inaugural Thesis presented to the Medical Faculty of the  
University of Pennsylvania, May 1, 1884.









THE  
ORIGIN, NATURE, SYMPTOMS  
AND  
TREATMENT,  
OF  
YELLOW FEVER,

BY  
DR. F. PAULA NOVAES,

(ST. PAUL—BRAZIL.)

RESIDENT PHYSICIAN AT THE PHILADELPHIA HOSPITAL.



---

Inaugural Thesis presented to the Medical Faculty of the  
University of Pennsylvania, May 1, 1884.





TO MY PARENTS

TO WHOM I AM INDEBTED FOR MY

MEDICAL EDUCATION,

AND TO THOSE WHO TAUGHT ME THE PRINCIPLES OF IT

THIS ESSAY IS DEDICATED

AS A

TOKEN OF RESPECT AND ADMIRATION

BY THEIR SON AND FRIEND

THE AUTHOR.





## PREFACE.

---

IN presenting this Thesis or essay to the Medical Faculty of the University of Pennsylvania, I feel most sorry it is not something more worthy of appreciation. But my conscience is clear, for it is unjust to expect of a beginner the roses of knowledge that time and experience have gathered up to older medical men. In my understanding a thesis is nothing more than any other lesson we undertake to learn, with the difference, however, that this is written and the other is not. In selecting yellow fever for the theme of my essay I did no more than I otherwise would had I only wished to obtain information concerning the nature and the treatment of the disease. Thus I have here a "note" of what I have read, and to this note I have attached my name. Nothing contained in it, except the imperfections and errors, is mine, therefore if any opinions are here omitted that do not go entirely in accord with the most recent views on the subject, these are given in the authority of others.

Yellow fever takes many types or forms, but only one—the most common one—is here described. In the discussion of the different views concerning the disease and its *modus operandi*, I have endeavored to point out all I know; and references to book, page, etc., where these views can be found are made for comparison.

Hoping these few pages will satisfy my professors, I must not forget to thank Prof. James Tyson for his kindness in introducing me to the Librarian of the COLLEGE OF PHYSICIANS, of this city, the finest medical library I ever saw, where most of my studies were made. To the Assistant Librarian, Mr. Fisher, I am also indebted for the kind attention paid to me.



. THE  
ORIGIN, NATURE, SYMPTOMS  
AND  
TREATMENT,  
OF  
YELLOW FEVER.

---

**History and Etiology.**—In the year 1690 a bloody revolution took place in the Empire of Siam, the French established there embarked for France in the ship *Orijamme*, commanded by M. de Lestrilles, and two ships of the India Company called the *Leure* and the *St Nicholas*. On their voyage to France they were forced by stress of weather to go into Fort Royal in Martinique. They brought with them a pestilential fever of which M. Lestrilles and a great part of the crews died, and which, spreading into the towns of Fort Royal, carried off a large number of the inhabitants. The contagion likewise spread to all vessels in the harbor, among which were two ships from Pondicherry, to the ship *Mignon*, and to a squadron of three ships of war, commanded by M. Ducasse; a great part of the crew of which died of the disease by June 1691. The squadron of M. Ducasse visited the Islands of St. Croix and St. Cristophe, and introduced the disease there.\*

The seed of the disease thus introduced in that fertile soil, germinated, grew, and spread into all surrounding towns of the West Indies, where the historian goes to show it never occurred before; and it continued to devastate in succession most of the towns of the American continent, and to be transported from the West Indies, as a nucleus of infection, to every part of the world, with which intimate commercial relations brought them into contact. Thus we have it appearing in

\*Moreau de St. Mery—Topographical and Physical Account of the Island of St. Domingo, vol. 1 p. 700, quoted by Carpenter.



several port towns of Spain and France which had much commercial intercourse with the West Indies; and in the United States we see that it occurred frequently in Charleston, in Philadelphia, and in New York, all of which carried on a considerable trade with these islands. Of the northern cities of the Union, Boston was one of the first to import the disease, in 1693. This fever was called, from the place of its origin, "Mal de Siam," the Siam fever or disease—the patients ail became yellow, particularly in fatal cases.

After this introduction, the name of Mal de Siam was dropped, and the fever was long called *Fièvre de Boullam*, or *Boullam fever*, and finally the name pestilential or malignant fever was adopted.

In South America, likewise, yellow fever never occurred until it was introduced by infected vessels. Thus in Brazil it appeared for the first time two hundred years ago, and caused a great mortality in the province of Pernambuco. Dr John Ferreira da Rosa, a Portuguese physician who described the epidemic very minutely at the time, states that the scourge was brought to that province by a ship from St. Thomas containing on board a large quantity of meats in a state of putrefaction. Since that remote epoch, only in 1848 was it that the disease *de novo* visited the American Empire, commencing its damages and destruction in the province of Bahia, in the month of October, brought, according to official documents, by the brig *Brazil*, from the port of New Orleans. On the 27th day of December, the same year, the first cases appeared in the city of Rio de Janeiro, brought by the American bark *Navarre* and steamer *D. Pedro*, both from Bahia.

During the first three months in 1850 the epidemic took great increment, extended throughout the whole city, made in March eighty, ninety, and more victims per day, attacked according to Prof. Torres Homem\* over nine thousand six hundred persons, in the great majority of cases foreigners, sacrificed four thousand one hundred and sixty lives, and only commenced to decline in April, extinguishing itself completely about the end of May.

In 1851 a second epidemic appeared, and took to the grave four hundred and seventy-five individuals; in 1852 the number of deaths was one thousand nine hundred and forty-three; in 1853 it was eight hundred and fifty three. During the next five years only some sporadic cases of yellow fever were observed—in foreigners and foreign sailors recently arrived in the port; but in 1860 another that made one thousand two hundred and forty-nine victims; in 1861 to 62 two hundred and fifty individuals died of the disease. From this epoch up to 1873, during the summer months, cases of yellow fever have been observed, always grave in the unacclimated foreigners, and producing a certain number of deaths. In December 1872, January, February and March 1873, an extensive and mortiferous epidemic again broke out in that city presenting many points of resemblance to that of 1850. In the first months of the year 1874 the population was again terrified by the appearance of great many cases of yellow fever, notwithstanding the epidemic having been very limited in its devastations.

\**Estudo Clínico sobre as Febres do Rio de Janeiro, 1877, p. 205.*

The mortality from yellow fever in Rio de Janeiro ranges from fifty to five hundred and more every year.

The following table shows the greatest mortality in the city of Rio during the worst epidemics of yellow fever prevalent there :

YEAR	DEATHS
1850	4160
1852	1943
1857	1125
1860	1449
1870	1217
1873	3467
1875	1291
1876	3517
1880	1573
1883	1464
1884	1276

The least mortality, not counting the sporadic cases, occurred in

YEAR	DEATHS
1851	471
1853	853
1859	500
1861 to 62	250

From 1854 to 58 and from 1862 to 66, only sporadic cases occurred.

The reports\* of the president of the "Central Board of Public Hygiene," Dr. Antonio Corrêa de Sousa Costa, show the number of deaths from yellow fever that occurred in that city during the twelve months of last year as follows :

January, 3 ; February, 48 ; March, 212 ; April, 506 ; May, 230-  
June, 111 ; July, 69 ; August, 38 ; September, 12 ; October, 6 ; No-  
vember, 15 ; December, 27.

From the above numbers it will be seen that this last epidemic though not as fatal as that of 1883, resisted the cold of May, June, and July. Another feature of the epidemic was the violence of the attacks, and the rapidity of their progress.

On the western coast of South America, in like manner, yellow fever was equally unknown until 1843, when it was introduced by vessels from New Orleans ; it soon became extinct, until again it was brought to Lima, Peru, in 1852, whence it extended to Valparaiso and other ports of Chili and neighboring countries.

On the western coast of Africa yellow fever has many times occurred at several points, introduced by infected vessels, during the commercial intercourse of the slave trade with the West Indies.

Europe, too, has been the victim of this terrible disease, as stated be-

—\*These reports can be found in numbers 46 (Feb. 16th), 65 (Mar 7th), 69 (Mar. 11th) 86 (Mar. 29th), 107 (April 19th), 125 (May 7th), 143 (May 25th), 153 (June 4th), 196 (June 17th), 218 (August 8th), 123 (Aug 13th) 237 (Aug, 27th) 272 (Oct. 1st), 288 (Oct. 17th), 301 (Oct. 30th), 314 (Nov. 12), 332 (Nov. 30), 359 (Dec. 27th,) of Vol. XXII and I (Jan. 1st 84) of the *Diário Oficial*, (the Brazilian Government official paper) published in Rio de Janeiro, in 1883.

fore. Lisbon was for a number of years the theatre of its calamitous scenes, and was almost depopulated. Spain, France, and Italy have also suffered; and in Great Britain and other parts of northern Europe the disease has occasionally been observed.

Having thus far traced the foregoing facts, it now becomes interesting to know the real *birth-place* of the disease.

As far back as I can go the first authentic appearance of yellow fever was in 1690, as described by Moreau de St. Mery. Some as Carpenter\* and Hargis† believe, and strongly assert, that it never occurred in the West Indies before that year, and that it was introduced there by the ship *Orflamme* from Siam; while other writers of high authority Prof. Stillé‡ among them, think the disease was originated in the Gulf of Mexico, and that it existed there in the fifteenth century. The first two named gentlemen claim, furthermore, that the disease was developed in the ship *en pleine mer*; and the latter trace its origin in the very islands of the West Indies. This is a subject of historical interest, but difficult to ascertain as authors are of such different opinions.

Whether yellow fever was generated on sea or ashore is of little importance, for, according to the French physician, Dr. Frederick Thomas,§ the disease can be developed in any locality whatever, presenting the following conditons.

"1. The locality should be intertropical or in the proximity to the tropics.

"2. It should be near to the sea, or to a great river.

"3. It should be naturally damp and subject to an abundant aqueous evaporation, especially during the night.

"4. It should be marshy or in proximity to marshes.

"5. Its soil should contain great deposits of organic matters, animal and vegetable, upon which the calorific rays of the sun determine a putrid fermentation, especially in the hot season.

"6. It should exist in many individuals unacclimated, living in narrow, badly ventilated and unhealthy places, as in certain compartments of a vessel, for example, and acted upon by an elevated and variable temperature."

The islands of the Gulf of Mexico unquestionably present all these combinations. Long continued heat, moisture, animal and vegetable decay, salt water, over crowding of individuals in certain port towns, neglect of hygienic precautions, want, in the lower class of people, of personal cleanliness and prudence, and exposure to variations of temperature, are all elements which favor the growth of the miasm which produce yellow fever. Not only do they favor but even stimulate the development of it; and this must be so since the West Indies have been known to be the nucleus of infection of all epidemics of yellow fever in this country and abroad.

\*Sketches from the history of yellow fever, etc., etc., New Orleans, 1844.

†Yellow fever; its ship origin and prevention, Philadelphia, 1880.

‡The Origin, Nature, Symptoms and Treatment of yellow fever, Philadelphia, 1880.

§Quoted by Prof. Torres Homem.



*Nature of and Opinions upon the Contagion:*—No one contests that the poison of yellow fever is specific and due to a miasm, which is originated in a focus of infection more or less extensive, and of variable fertility. As to the nature of this miasm science is as yet in darkness. Since 1855 when the great La Roche brought forth his views in favor and against the specific microscopic germs of the disease, numerous investigations have been made in several countries; but the question remains as yet to be settled.

Prof. J. G. Richardson,\* of the University of Pennsylvania, observing that many tube casts in the urine of yellow fever patients are made up partly or wholly of fungous spores (micrococci), and also that the kidneys of some patients dying of it had their uriniferous tubules generally obstructed by plugs of micrococcus, advanced the theory in Richmond in 1878 that the suppression of urine so common in fatal cases of yellow fever was more or less mechanically due to this occlusion of the renal tubules.

The contagion vivum of yellow fever, according to Dr. Carmona,† of Mexico, is a spore and mycelium, to which he gives the name of *Peronospora lutia*. It is found in all the secretions, and also in the blood, in the serum of blisters, etc.

In making some experiments upon animals, it is claimed that he found that the urine containing these organisms, if injected under the skin of rabbits and dogs, produced a febrile reaction lasting two or three days, during which the spores were also present in the urine of the animal. Furthermore, the animal was not affected by a second injection. He concludes, therefore, that in order to protect from yellow fever, it is only necessary to inoculate with a small quantity of water in which the specific fungus has been artificially cultivated.

Prof. Freire, of the Faculty of Medicine of Rio de Janeiro, in a communication to the press of the capital of Brazil, states that he has discovered in the black vomit, blood, urine, and other fluids of the body, a microbe (*Cryptococcus*) which he believes to be the agent upon which yellow fever depends for its action. The following is an abstract of an article published in the *Journal Officiel de l'Empire du Bresil*, for May, 8, 1883,‡ in which he states that he has found the *cryptococcus xanthogenicus* in the soil from the grave of an individual who died of yellow fever.

\*Philadelphia Medical Times. Vol. XII. page 558.

†Bull. de Therapeut. Med.—Chirug. also Philadelphia Medical Times, vol. XIII. April 21, 1883, page 504.

‡Part of this article has been translated by myself in a former occasion and published in the Philadelphia Medical Times, for June 16th, 1883, thus:

YELLOW FEVER IN BRAZIL.—By order of the Brazilian Government, the Professor of Organic Chemistry of the Faculty of Medicine of Rio de Janeiro, Dr. Domingos Freire is continuing the work begun in 1880 upon the cause, nature, and treatment of yellow fever, especially in regard to the existence of any peculiar microbes, their cultures, and the effects of attenuation and of antizymotic remedies upon them.

To three students a monthly stipend of reis 120,000 (about sixty dollars) is allowed, to aid in these studies in the maritime hospital of Santa Isabel.

As a primary result of his studies, Prof. Freire has sent a communication to the *Journal Officiel de l'Empire de Bresil* (May 8, 1883), in which he states that he took in the cemetery

"En remplissant la mission, que le Gouvernement Impérial a bien voulu me confier, je me suis trouvé en présence de différents faits qui intéressent beaucoup la pathogénie et la thérapeutique de la fièvre jaune, et que je relaterai en temps opportun dans un travail spécial.

"Mais je crois de mon devoir de divulguer sans retard un fait qui a une grande importance au point de vue de l'hygiène publique. En effet, étant allé visiter le cimetière *Jurujuba*, où sont inhumées les personnes décédées à l'hôpital maritime de Santa Isabel, j'ai recueilli, à une profondeur de dix centimètres environ, un peu de terre dans une excavation pratiquée au-dessus de la sépulture d'un individu mort de la fièvre jaune, il y a un an à peu près.

"Cette terre, quant à l'aspect, à l'odeur et autres caractéristiques extérieures, ne présentait rien d'anormal.

"Néanmoins, ayant soumis quelques parcelles de cette terre à l'examen microscopique, faisant usage d'un agrandissement de 740 diamètres, et après avoir pris toutes les précautions, je trouvai des myriades de microbes absolument identiques à ceux que j'ai découvert dans le vomissement noir, dans l'urine, le sang, et les autres liquides organiques des malades atteints de fièvre jaune; c'est à dire des cellules du *Cryptococcus xanthogenicus* dans différents périodes de développement, depuis la grandeur d'un point noir difficile à apercevoir sur le champ du microscope, jusqu'à des corpuscules ronds plus ou moins volumineux, refractant fortement la lumière, les uns grisâtres, les autres entièrement noirs ou simplement entourés d'une auréole noire.

"Un grand nombre de ces organismes exécutaient des mouvements spontanés. On voyait aussi des masses jaunâtres parsemées de granulations, masses provenant de la substance pigmentaire des cellules, outre quelques particules noires, débris des *Cryptococci*.

"Finalement, j'observai également des vibrions que se mouvaient avec rapidité."\* \* \* \*

And he goes on to prove that these germs perpetuate themselves

*Jurujuba*, where the deceased persons from the maritime hospital of Santa Isabel are buried, a little of the soil from beneath the grave of an individual who died of yellow fever one year ago. In its aspect, odor, and other external characters, this soil presented nothing abnormal. But microscopical examination with a power of seven hundred and forty diameters revealed the presence of myriads of microbes absolutely identical with those in the black vomit, in the urine, blood, and other organic liquids, of patients seized with yellow fever—that is to say, cells of *Cryptococcus xanthogenicus* in different stages of development.

A great number of these organisms executed spontaneous movements. Yellowish masses, protruding from the pigmentary substance of the cells, full of granulations, and some other black particles, debris of *Cryptococci* were also seen. Finally, there were observed vibrions moving with rapidity.

These observations, which have been verified by MM. Chapot, Augusto Cesar, and Caminha, clearly show, says Prof. Freire, that the germs of yellow fever perpetuate themselves in the cemeteries, which are equally *pepinieres*, where new generations, destined to devastate our city, are elaborated. After passing through the porosities of the earth, these germs disperse themselves in the atmosphere; others are carried by torrential rains to the streets and squares, and, finding there a centre favorable to their evolution, they provoke the invasions of the epidemics in the summer, the season most propitious for their proliferation.

The presence of the microbes of yellow fever in the cemeteries corroborates in every way the observations of Pasteur made relatively to the microbes of malignant pustule.

To prevent the spread of yellow fever, the professor proposes cremation of all persons who die of the disease.

in the cemeteries during the winter to come out in the summer, the season most adapted and propitious for their proliferation. Infecting the atmosphere or being carried away to the streets and squares by the torrential rains, they provoke, he thinks, the invasions of the disease.

As a definite and radical measure he proposes cremation of all persons who die of yellow fever.

Prof. Torres Homem,\* of the Faculty of Medicine of Rio de Janeiro, supposes that the miasm is a mixed and complex one; combining in its composition the marshy miasm, on the one hand, and the typhus on the other; containing therefore one element of vegetable origin and another of animal origin; and that upon the reunion of those elements, now one and again the other predominating, the maritime influence comes to impress a certain modification that gives it a special form, thus producing the miasm of yellow fever.

Yellow fever is a highly infectious disease and capable of being transported from place to place. It is not contagious, that is, not conveyed from sick to well by means of direct contact or indirect communication through any medium whatever. Though many authors, as Dutrouleau, Jobim, Pugnet, Pariset, Andonard and Gerardin, consider it contagious, clinical observations have convinced the greater number of physicians, as Miller, Dalmas, Valentim, Devèze, Thomas, Stillé, Chervin, Torres Homem, Lefort, Rochoux, and many others, that it is simply, but highly, infectious. The following few more opinions, derived from extensive experience and observations, will suffice to settle this question.

Dr. W. P. Hope,† after describing many cases of personal exposure, observed in his practice during the epidemic of yellow fever of 1878, in Tennessee, without the disease ever having been conveyed from person to person, concludes as follows:

"1st. Some other manner of introduction should be shown than that of personal introduction, *i. e.*, of a person divested of clothing, we might say, and simply sick of yellow fever.

"2d. That other ways of dissemination must account for the spread of yellow fever than that of personal intermingling."

Dr. Bartholow,‡ says: "It is not by personal contact the disease," speaking of yellow fever, "is communicated—in other words, it is not a contagious but an infectious disease, and it is not against individuals that quarantine restrictions should be enforced, but against articles of clothing, bedding, or the like, or against all fomites."

Dr. Nott,§ says: "Yellow fever is not generated in the human system nor transmitted from one person to another in any way; its germs or poison is generated outside of the human system, and is taken into the system after the manner of the marsh malaria poison. But, unlike the

\*Estudo Clinico sobre as Febres do Rio de Janeiro 1877, p. 209.

†Transactions of the Medical Society of the State of Tennessee, at its 46th Annual Meeting, Nashville, Tenn., 1879, p. 157.

‡Treatise on the Practice of Medicine, New York, 1882, p. 717.

§Quoted by Prof. Stille.



latter, its germ is portable, and may be carried from one point to another, and thus propagated."

And, finally, we have Dr. Warren Stone\* expressing his opinion thus: "I am perfectly convinced, beyond all doubt or hesitation, that, personally, it is not contagious; I *know* that it is not."

The fact being thus established, and the disease being conveyed through fomites and like media, it becomes evident that all sanitary measures and quarantine regulations should be adopted to prevent the entrance of infected vessels from yellow fever ports in time of epidemics. Were these measures taken, the inconveniences and damages of the disease would not have caused so much loss in this and other countries.

The disease usually prevails among individuals recently arrived in the yellow fever spot, and foreigners unacclimated, among white people rather than among the colored, and among children from two to ten years of age; this last being distinctly observed in Rio de Janeiro in 1873. Among its prevailing causes are intemperance and other excesses; indigestion, abuse of unripe fruits, exposure to night air and dews, colds and fatigues from excessive work, are other causes which ordinarily provoke the disease. Like typhus and typhoid and the other eruptive fevers, it occasionally attacks those who have already paid tribute to it.

**Symptoms in General:**—Yellow fever in its natural march presents three distinct stages: the first is called the stage of invasion, also, congestion, inflammation, and irritation, in which the patient presents symptoms of great weakness, congestion, and inflammation in several organs; the second is called the stage of remission, when the symptoms are totally dissipated, or more or less decreased in intensity; and the third is called the stage of collapse, or secondary fever or hemorrhagic, or ataxo-adynamic, in which the disease is characterized by the appearance of hemorrhagic phenomena, among which the black vomit, and the ataxo-adynamic phenomena predominate.

The prominent symptoms of yellow fever vary in different epidemics and cases exhibit all grades of intensity, from a very mild form of the disease to one of the most malignant type. But the three stages usually may be recognized, followed by a *period of incubation* of from two to fifteen days.† Or, there may be no period of incubation; indeed in the majority of cases the disease attacks the individual when he least suspects it, while at his best health. And it is not always that yellow fever presents the three stages; in these cases the symptoms of the last stage rapidly substitute those of the first, or these mix with those of the third, it being thus impossible to discriminate the stages. As a general rule, the gravity of the disease is in the inverse ratio to the distinction of stages; in the very grave cases the phenomena are presented so irregularly and with such a rapidity that in less than forty-eight hours the individual passes from the state of health to the condition of cadaver, as Prof. Torres Homem has observed.

**1. Invasion Stage.**—The attack may be preceded by premonitory symptoms, or may come on suddenly. Chills of variable duration

\*Quoted by Prof. Stille.

†Roberts, The Theory and Practice of Medicine, Philadelphia, 1881, p. 240.

generally occur at the outset, being followed by a severe supra orbital cephalalgia. This pain is very characteristic; extending from the orbits and darting from temple to temple. These alternate with a sense of heat, and soon there is marked pyrexia, its degree being in proportion to the previous chills; accompanied by severe pain in the back, and limbs. The face is flushed, the eyes are injected, watery, and very sensitive to light. The teguments of the trunk, mainly in the thorax, are hyperæmic. The pulse is frequent, from 90 to 120, and in most cases full and strong. The patient is restless, and moves on the bed with difficulty, not only due to the debility, but also because the movements increase the pain in the back and limbs. The tongue is sometimes covered with a heavy fur, and in this case there is a bilious vomit, or the fur is moderate, and then there is only nausea; or it is simply red at the tips and edges, with enlarged papillæ. Sore throat may be complained of, and there is constant desire for cold drinks or ice. There is pain in the epigastrium, spontaneous or provoked by pressure and percussion. The liver is very often enlarged; the spleen is normal; the bowels are constipated; diarrhœa is very rare, and was observed only once in 112 persons by Prof. Torres Homem. The urine diminishes, is red and concentrated; "albuminuria may manifest itself in the first period, and with the progress of the disease in its passage from the first to the second, and from this to the third stage, it may disappear or still continue to be precipitated under the action of reagents"\* The mind is usually clear, but sometimes there is delirium or sopor.

Not all these symptoms that characterize the invasion stage of yellow fever deserve the same importance; some, that I will consider cardinal, are worth a great deal, others, that I will classify as secondary, are of significance. The cardinal are: The supra orbital cephalalgia, the aspect of the face, of the eyes, and of the tegument of the thorax, the pain in the lumbar regions and limbs, the albuminuria, when it exists, and the march of the heat. The icteric color, though very rare in the first stage of yellow fever, may, however, manifest itself in a very pronounced way in all the cutaneous surfaces.

The thermometer is of extreme value in the study of yellow fever; but not possessing myself opportunities for investigation, all I can do will be to quote here the results of Prof. Torres Homem's investigations in the *Hospital de Nossa Senhora d'Ajuda*,† in Rio de Janeiro. These investigations have been corroborated by similar ones of Dr. Domingos de Almeida Martins Costa,‡ a resident physician in that institution, and were obtained from long experience and personal contact with hundreds of cases of yellow fever. Neither time nor space, however, permit me to give his whole description, therefore I will limit myself in copying his conclusions, which are as follows:

\*Costa Alvarenga, *Anatomic Pathologique et Symptomatologie de la Fievre Jaune* qui a regne a Lisbonne en 1857. Paris 1861, p. 106.

†Lição de clinica sobre a febre amarella, feitas na faculdade de medicina do Rio de Janeiro, pelo Dr. Joao Vicente Torres Homem, 1873, 1 vol. with 168 pages in 8 o. See also, *Estudo Clinico Sobre as Febres do Rio de Janeiro*, 1877, p. 220.

‡Do valor das investigacoes thermometricas no diagnostico, prognostico e tratamento das pyrexias que reinam no Rio de Janeiro. *Inaugural Thesis*.

"1. The patient that, in an epidemic season of yellow fever, should present a febrile heat superior to  $40^{\circ}$ , especially if this temperature has arrived at such a point rapidly, must be considered as affected with the prevailing disease;

"2. If the maximum of the temperature, lasting only three or six hours, should be followed by a rapid lowering, without it being accompanied by any of the third stage phenomena, the disease very probably will abort;

"3. If the heat of the first stage should maintain itself at its apogee for more than eighteen hours, without being modified by the means called antipyretics, the appearance of the third stage will be very probable, as it is very likely also that the disease will be of extreme gravity;

"4. If the fall of the febrile heat of the first stage should take place rapidly, the thermometer marking a temperature inferior to  $38^{\circ}$ , the duration of the second stage will be a short one;

"5. If the maximum temperature of the first stage should remain stationary for more than twelve hours, the symptoms of the third stage will consist of hemorrhages mainly;

"If the duration of the maximum febrile heat should be very short, the third stage will be characterized by ataxo-adyynamic phenomena."

Among the secondary symptoms of the first stage there are some which deserve special attention. The failure of strength is frequently observed in the tropics, but the disease may run its course and death ensue without any loss of force, as observed in two cases by M. Louis.\* When it exists the patients scarcely can stand on their feet, and others have no courage to sit on the bed. Cramps in the lower limbs may be complained of; cases in Brazil have been known to present this symptom for hours. Delirium is rare but sometimes exists; dry tongue is also rare, but it may be observed, or it may present itself covered with a slight layer of fur, or thickly coated white or yellowish. In a few cases vomits appear in the first stage; these symptoms, however, always coincide with the presence of the free furred condition of the tongue, revealing as this does, a pronounced gastric impairment. Constipation is extremely common in this stage of the disease, but diarrhœa, though almost never observed, may take its place. Congestion of the liver seldom fails, especially twenty-four hours after the appearance of the initial symptoms; congestion of the spleen is still rarer than diarrhœa.

The stage of invasion lasts from a few hours to two or three days usually, but may extend to four or five days. It is longer in the milder cases.

**2. Stage of Remission.**—The second stage of yellow fever is characterized by the complete cessation or great diminution of the febrile reaction, and the pains in the head and back. This marked improvement may or may not coincide with the appearance of some cutaneous perspiration and abundant diuresis.

When this stage presents itself in a complete way, the thermometer

\*Arch de Med. 1840, p. 27, quoted by Dr Costa Alvarenga.



marks  $37^{\circ}$  or  $37^{\circ}$  and a few tenths; sometimes it falls below normal. The more pronounced the diminution of the febrile action is, and the more rapidly that diminution is effected, the more urgent and imperious becomes the indication for the preventive therapeutical means of the third stage. As a general rule, the less complete this stage is, the more probable the manifestation of the third becomes, and its symptoms are graver, and the preventive therapeutics less efficacious. The thermometer in these cases is a sure guide to the physician; if, after thirty-six hours, or two days, the temperature does not come down to  $37^{\circ}$  and some tenths, or if it remains above  $38^{\circ}$ , the third stage must be expected very soon.

There are four symptoms that may present themselves in the second stage of this disease, and which indicate the near appearance of the third. The first is the permanency of the fever; the second is the albuminuria, which, not having appeared in the first stage, manifests itself in the second, and coincide with the existence of fever. If, however, it exists without the least fever, it will have no influence on the termination of the disease. But, as said before, if both exist at the same time, not only will the third stage be very close, but its symptoms, also, will be very grave. If, instead of albuminuria, anuria, or suppression of urine, be observed, no matter whether it existed in the first stage or is only observed now, the third stage will not be prevented by treatment. This, at least as observed in Brazil, is the gravest and most cruel symptom of yellow fever, especially when its duration goes beyond twenty-four hours.

The third symptom which indicates the extreme gravity of the patient is the anxiety, or distressing sense of oppression felt at the epigastrium. This always precedes in a few moments the appearance of the first "black vomit," but it may last some hours, and then it is only later on in the course of the disease that the hemorrhagic or ataxo-adynamic symptoms manifest themselves.

The fourth symptom is insomnia. This symptom may prevail alone or combined with the preceding ones. In the cases in which insomnia is a sign of the appearance of the third stage, this is characterized by the phenomena of ataxia and of adynamia, the hemorrhages being limited to but a small number of bloody vomits.

In some exceptional cases of yellow fever two more symptoms appear in the second stage, which belong more commonly to the third; these are the vomits and the yellowness of the skin.

The duration of the stage of remission is usually but a few hours; or, in the grave cases of the disease, it may not be observed at all; the first stage is immediately followed by the third, without any phenomena of transition between them; or the second is mixed with the third and the disease runs its course in the short space of two or three days.

**3. Stage of Collapse, or Secondary Fever.**—It is in the third stage that yellow fever takes its distinctive character. Hemorrhages of various kinds are now observed.

The first hemorrhage that ordinarily manifests itself is the gastric,

gastrorrhagia or hæmatemesis, which is announced under the form of black vomit; this may, in the milder cases, be preceded by white vomit. The black vomit varies very much in quality and quantity. Sometimes the patient that had not vomited before commences vomiting the remedies taken; afterwards the matters expelled from the stomach consist of bile of a greenish color, mixed with the liquids contained in that chamber; and later on dark granular matter with a certain quantity of bilious liquid is observed. In some cases this vomit is homogenous, and perfectly similar to black writing ink; in others a certain quantity of dark blood comes from the stomach. Commonly chocolate color vomits are observed, preceded by mucous and bilious ones. The color and aspect of the vomit of the third stage of yellow fever depend upon the quantity of blood extravasated in the stomach and on the amount of bile with which it is mixed.

Though the black vomit is very constant in this disease, yet it may not be observed. In these cases the stomach does not expell its contents, but these remain in the interior of the organ and distend it to great proportions, and may be seen in the autopsy to be in great quantity; or, again, they pass to the intestines and are evacuated with the fæces.

Besides hæmatemesis, other hemorrhages, such as from the bowels, nose, mouth, urinary passages, skin, vulva, etc., etc., may occur.

Suppression of urine is a very frequent symptom in some epidemics, and rare in others; it is a very grave symptom indeed, the most cruel of all. When the kidneys stop separating the urea from the blood, besides its dyscrasia, uremic poisoning sets in, putting the patient's life at an end. Paralysis of the bladder may exist, in this case the catheter must be employed to remove the urine. It is in this stage that the yellow color of the skin becomes intense and generalized.

Such might be considered a picture of the hemorrhagic type or form of yellow fever; but the disease may be characterized by different symptoms, independent of, or in combination with, the hemorrhages; these are the so-called ataxo-dynamic or typhoid symptoms. Anxiety, sobbing, eyes dull, comatose condition, or restlessness, the patient desiring to throw himself out of bed, deafness, delirium, trembling of the tongue, carphologia, or picking at the bed clothes, subsultus tendinum, convulsions, in some cases of an epileptic form, complete prostration, indifference and misery; such are the phenomena ordinarily manifested. Insupportably fetid evacuations, intense inflammation of the tonsils, causing asphyxia, dyspnoea, expired air being cold and fetid, pulse filiform, irregular, or soft and frequent, hemorrhages from all solution of continuity, from the conjunctiva, afterwards gangrene; decubitis dorsal, with the extremities in supination, parotid abscesses, cold extremities, diminished temperature, cold sweats, gangrenous ulcerations over the trochanters and sacral regions, etc., are other symptoms equally observed.

To these symptoms, noted from the observation of nearly 4000 cases in the hospitals of Rio de Janeiro, may be added others frequently met with in private practice, which, in the opinion of Dr. Paula Can-

dido\* are worthy of especial attention. He enumerates the following :

Defective memory ; from the moment of invasion, or in one or two hours, the patient is unable to explain ; he is conscious of loss of memory. Sometimes intense pains in the lower extremities, in the lumbar regions, etc., constant pain in the supra orbital region, at least in the first period of the disease ; a weakness in convalescence ; in some cases the intelligence remains clear till the moment of dissolution.

Secretion of mucosities from the stomach, œsophagus and internally so excessive that their expulsion is very difficult, and they require to be removed. Incessant thirst. The pulse throughout compressible or soft, for the sigmoid aortic valves being closed and the muscles which compress the arterial system being relaxed, the elasticity of this system is deprived of these auxiliaries, and yields to any pressure whether the artery, provided it be full, contains a greater or less amount of blood. Miliary eruption, urticaria, etc., even in individuals not attacked, but threatened.

**Anatomical Characters.**† - The cadaver of the individual victim of yellow fever generally presents in its exterior some signs of importance. The first of these is the yellowness of the skin, with violet colored spots, entirely violet, or in some cases lead colored ; in some petechiæ and sudamina, principally on the thorax and abdomen ; in a few cases the skin is marked by furfuraceous desquamations. In two cases described by Dr. Lallemand‡ the conjunctivæ were so much injected as to simulate large coagula ; ulcerations over the sacrum and great trochanters. In general all solutions of continuity present a gangrenous aspect, and on the surface as well as through nearly all the tissues an infiltration of a yellow liquid is observed.

*Digestive Apparatus.*—In some cadavers inflammation of the œsophagus, its mucous membrane softened in patches, covered with a glutinous liquid, more or less dark colored, analogous to the dark liquid vomited during life. In most instances the stomach contains a black liquid, in a few, it is yellow or reddish ; the mucous membrane is of a red color, sometimes so loaded as to simulate ulcerations and echymoses ; it is softened ; the pylorus presents more extensive excoriation than the cardia. The color, texture and liquids found in the duodenum are characteristic of the same lesions, but it is not so frequently affected. In some instances the liver is normal in condition, in others it is enlarged and marked with red spots, or is of a friable texture. The gall-bladder always contains bile, in variable quantity, dark colored, of a muddy green, or of normal color ; change of its density is seldom observed.

*Urinary Apparatus and Peritoneum.*—The bladder contains more or less urine, dense, dark, yellow ; sometimes of a normal color, or

\* Relatório sobre medidas de salubridade reclamadas pela cidade do Rio de Janeiro, e a cerca da Febre Amarella em particular, para subir a Augusta Pessoa de S. M. o Imperador, pelo Dr. Francisco de Paula Candido, etc., etc., Rio de Janeiro 1854, folio, pp. 31.

† The description here given of the post-mortem appearances is from the extensive observations of Drs. Paula Candido, Lallemand, Torres Homem and Costa Alvarenga.

‡ Observações acerca da epidemia de Febre Amarella do anno de 1850, no Rio de Janeiro, colhidas nos hospitales e na polyclinica, pelo Dr. Roberto Lallemand, etc., etc., 8 vo. pp 152, Rio de Janeiro, 1851.



it is contracted and without liquid. Its mucous membrane is more dense and injected about the neck than in the fundus. In most instances no change is noted in the kidneys; sometimes their volume is augmented and their color is darker than usual. The peritoneum in a great number of subjects is injected at points, and marked by lead colored spots.

*Nervous Apparatus.*—No alteration in the consistence of the cerebral mass worthy of notice is observed in some cases; but in others it is more flaccid than natural. The meninges and encephalon are injected; in the latter the injection being in points, more or less distinct; a serous or a slight sero-sanguinolent effusion is found in the ventricles, and in the cavities of the arachnoid; effusion of blood in the cerebrum is rarely observed. Yellow or sanguinolent serosity is found in the interior of the arachnoid; the envelopes of the medulla are more or less engorged.

*Respiratory Apparatus.*—Passive congestion and partial engorgements are found in some part of the lungs with minute crepitations; signs of inflammation in the mucous membrane lining the bronchi are noted; these changes, however, not being constant.

*Circulatory Apparatus.*—Effusion in small quantity, of yellow or sanguinolent serosity is found both in the pericardium and endocardium, without a trace of inflammation in either organ. In many cases dark blood with or without soft coagula is found in the cavities of the heart and in the great vessels; in some cases they are empty.

It will be seen from the description of the symptoms and pathological characters, that the organs mostly deranged in their function and structure are the blood, the stomach and kidneys.

In yellow fever there is a dyscrasia of the blood, determined by the miasm which infects the organism and produces the disease. This dyscrasia affects the fibrin and red corpuscles; the fibrin loses great part of its plasticity, becomes soft and pliable, and coagulates with difficulty; the corpuscles are altered in their morphological condition. The numerous and various hemorrhages observed in the third stage of this disease are due to that dyscrasia.

The yellow color of the skin is caused by the blood stagnated in the capillaries; and also, according to Drs Costa Alvarenga and Torres Homem, to the alterations that the bile suffers in the interior of the hepatic gland, as well as the retention in the blood of the principles that concur for its secretion.

**Diagnosis.**—Yellow fever may be confounded with bilious remittent fever. But the differential diagnosis can easily be made by referring to the following table from Prof. Da Costa's excellent work on "Medical Diagnosis," which makes the contrast between the two very well defined.

YELLOW FEVER.	BILIOUS REMITTENT.
Of short duration, ending commonly in from three to seven days.	Lasts nine days or upward.
Period of incubation from five to nine days.	Period of incubation very variable; may extend to months.

## YELLOW FEVER.

A disease of one paroxysm, terminating in recovery or in collapse.

Very severe nausea and vomiting throughout; early and decided epigastric tenderness; black vomit.

Hemorrhages from gums and variolous parts of the body.

Tongue clean, but slightly covered; pulse very variable, becomes slow in last stages.

Highly injected, humid eye; often fierce or anxious expression of face.

Supra orbital pains, and pain in back and in calves of legs.

Very rarely delirium; mind generally clear.

Urine generally contains albumen; suppression of urine common.

Little muscular prostration; often rapid convalescence; no sequelæ.

Almost certain immunity after one attack.

Very high mortality; disease is epidemic.

Treatment unsatisfactory.

Autopsy shows inflammation, or very great congestion, of stomach, and sometimes ulcerations or softening. Liver enlarged, of a yellowish color, its secreting cells filled with oil globules. Heart often exhibits disintegration of muscular fibres.

## BILIOUS FEVER.

A disease of several paroxysms, with intervening remissions.

Nausea and vomiting not so severe; and rarely as marked at the outset; neither as early nor as constant and decided epigastric tenderness; vomiting of bile and of the contents of the stomach.

No hemorrhagic tendency.

Tongue heavily coated; pulse varies less, is always quick until convalescence sets in.

Eye not peculiar; different physiognomy.

Headache; sense of fulness in head; often no pain in loins or in legs.

Delirium frequent; mind always dull.

No albumen in urine; suppression of urine rare.

Much greater muscular prostration; slow convalescence and tedious sequelæ.

One attack seems rather to predispose to others.

Slight mortality; disease more endemic in its nature.

Very amenable to treatment.

Autopsy shows congestion of stomach; more rarely a high degree of inflammation. Liver of an olive or bronze hue, not fatty.

Besides these differential symptoms, others, as given by Prof. Alfred Stillé, might be mentioned, the recollection of which will prove of great usefulness in the discrimination of the disease. Of these the following might be enumerated; yellow fever occurs in towns, usually sea-ports, or breaks out in ships at sea; bilious remittent fever prevails in the country, by fresh water streams, lakes and marshes. Yellow fever prevails in hot latitudes and in hot seasons; bilious fever in temperate as well as hot latitudes, and, in great part, beyond yellow fever limits. Yellow fever arises usually during the hottest weather; bilious remittent occurs when the nights have become cool. Yellow fever originates only in and near the Gulf of Mexico, never in Europe, Asia, Africa or on the Pacific coast of America; bilious fever originates all over the world, except in very cold climates. Yellow fever seldom attacks the acclimated; bilious remittent attacks acclimated and non-acclimated alike. In yellow fever jaundice is rarely absent, and is of a lemon

color usually; in bilious fever jaundice is often absent, and generally of an orange tint. Yellow fever is communicated by fomites impregnated with miasm; bilious fever is not communicable at all. Quinia does not prevent or control yellow fever; in bilious remittent fever it acts both as a prophylatic and an antidote.

**Prognosis.**—Yellow fever is always a formidable disease, but the mortality varies much in different epidemics. In Brazil, where it rages every summer, from 10 to 50 per cent. die, according to the intensity of the attack. In the epidemic that occurred in Philadelphia in 1853, it is said the proportion of deaths was 75 per cent., and in Barcelona in 1821, among hospital patients it reached 90 per cent. It has been observed that many apparently hopeless cases recover, while others which seem to be mild prove speedily fatal: these facts should be taken in consideration in foretelling the future of our patients.

**Treatment.**—In the first stage of yellow fever there are congestion and even inflammations; in the third there are hemorrhages, adynamia, ataxia—the conditions of the organism are therefore entirely opposed. In the first there is no gravity in the phenomena, no danger threatening life immediately; in the third the patient is constantly threatened with death. It is clearly evident then that for each one of these stages there must be a treatment; and that the means indicated in one are unfit in the other, the conditions of the organism varying according to the stage of the disease, the therapeutics must vary also.

During the first stage of yellow fever, when the viceral congestions are very pronounced and there exists hyperæmia of the cerebral meninges and of the cerebrum itself, many physicians are very fond of bloodletting. Undoubtedly good results have been obtained from this practice, and the patient that is young, robust, and plethoric, with a full, strong pulse, cannot be injured by the loss of a few ounces of blood. There are physicians in Brazil, whose scientific and practical merits no one dares to contest, who use bloodletting as an invariable treatment in the first stage of yellow fever, administering soon afterwards a good dose of sulphate of quinine.

At the outset the feet should be immersed in a warm mustard foot-bath, at about blood heat, and the patient be covered with warm bed clothing so as to perspire. When the patient has perspired freely purgatives, especially castor oil and calomel, are generally given. Emetics are also given, especially when there is pronounced gastric impairment. When the tongue is covered with a heavy layer of white, or yellowish white, fur and this gastric impairment is very manifest, many practitioners do not give diaphoretics or cathartics, but simply emetics—tartar emetic, for instance. With this means the patient vomits, evacuates and perspires, and the desired remission is promptly manifested.

In the second stage, or that of remission, if the symptoms are mild, nothing is required to be done but to maintain the bodily and mental rest of the patient, and to administer food appropriate to his condition, such as delicate animal broths if possible, and in small quantities at a time, or else milk and farinaceous preparations. Alcoholic stimulants



well diluted are also valuable. Champagne is most beneficial if it can be obtained.

Prof. Torres Homem advocates the use of quinine in this point of the disease, and believes that the third stage can sometimes be shortened by its use. And Prof. Freire\* enthusiastically believes that salicylate of sodium acts as an antidote. He advises its use hypodermically during the first and second stages in increasing doses according to the severity of the attack. The acid must be perfectly neutral, and dissolved in water as a vehicle, and the solution should be freshly made. This mode of treatment is entirely new and has given very good results, the average mortality coming down to 15 and 10 per cent. Prof. Freire says in his interesting work on yellow fever that all the physicians who have adopted his treatment have obtained very good results.

If the stage of remission is only a short one and is followed by that in which hemorrhages occur, then the danger is extreme and the means of safety feeble. The skin now grows yellow, the eyes more injected and wild, the stomach more irritable, and the vomited liquid more acrid. Mustard plasters must be applied to the epigastrium and the back of the neck, and cool drinks or ice given by the mouth. The irritability of the stomach can be modified by the administration of lime water and milk, or by a little spirit of chloroform in some aromatic vehicle, and also by demulcent enemata. Hydrocyanic acid, creosote, and chlorodyne, have been found most useful in allaying the vomiting. Morphia can be given hypodermically in very small doses if there is active and exhausting delirium. The rest of the treatment consists in meeting the symptoms as they arise.

Food of such a nature as not to irritate the stomach, and general tonics and stimulants to build up and fortify the system are to be used in convalescence. In this period of his trouble the patient should not exert himself bodily or mentally. Change of air is very desirable, and whenever circumstances permit, the patient should be taken to some quiet mountain place to stay until entirely recovered.

\*Recueil des travaux chimiques des Dr. Domingos Freire, etc., etc.; suivi des recherches sur la cause, la nature et le traitement de la fièvre jaune. Rio de Janeiro, 1880.

### ADDENDA.

Since the writing of this paper, several facts,\* products of the results obtained by the Committee appointed by the Brazilian Government, for the study of the nature, cause, etc., etc., of yellow fever, of which Prof. Domingos Freire is the chief, have come to my knowledge. Since the discovery of the *Cryptococcus Xanthogenicus*, described on page 6, hundreds of persons in Rio de Janeiro have been inoculated with that germ, modified by means of six dilutions in gelatin, and the results have been simply a mild febrile attack, easily overcome by therapeutical agents, indicated in common cases of fever. It would

\* These have been gathered from the "Picayune," New Orleans, July 13, 15, 18, 1883; "Dia io Official," Oct. 4th, 1883; "New York Herald," Nov. 2nd; "El Monitor Republicano," Mexico, Nov. 30th, 1883; "La Patria," Mexico, Dec 7th, 1883.

appear from these experiments that a perfect vaccine virus, capable of so modifying the nature of yellow fever as to reduce its virulent force can be established. But until more abundant experiments shall prove the correctness of our hopes we must simply take these facts as they stand. I should state, however, that I am informed that five persons thus vaccinated had the disease, but in the simplest degree of its activity, and soon recovered completely from their sickness.











